

Notes on the Genus *Hedychium* J. Koen. (Zingiberaceae) in Mizoram, North East India

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Abstract

The present study was carried out during 2007-2010. The species under genus *Hedychium* J.Koen. (Zingiberaceae) found in Mizoram have been described together with the key, ecology, geographical distribution phenology and uses. A colour photoplate is provided. Out of 12 species, six species, viz., *Hedychium ellipticum* Buch.- Ham., *Hedychium flavescens* Carey ex. Rosc., *Hedychium rubrum* A.S. Rao and D.M. Verma, *Hedychium stenopetalum* Lodd., *Hedychium thyrsoforme* Buch.-Ham., *Hedychium yunnanense* Gagnep are reported for the first time from Mizoram, India.

Keywords: *Hedychium*; Distribution; Phenology; Mizoram; Northeast India

Methodology

Introduction

The genus *Köenig* [1] is a medium-size plant of the family Zingiberaceae. It is commonly called as “ginger lily” or “butterfly lily” which produces one of the most beautiful and fragrant flowers in the Zingiberaceae [2]. The flowers are short lived. The genus is widely cultivated for their medicinal potential and horticultural significance. It is also used as a raw material for manufacturing paper and perfume. Members of the genus can be easily recognized by its showy, numerous-flowered terminal spikes, some of which have been cultivated worldwide [3].

The genus comprises 65 species worldwide [4]. They are mainly distributed throughout tropical Asia to New Guinea, Australia, the Solomon Islands, New Hebrides, New Caledonia, Fiji and Samoa [5]. However, Sirigusa and Larsen [6] has reported about 80 species. *Hedychium* is the largest genus of Zingiberaceae in India with about 44 taxa [7], and are mostly restricted to the North-Eastern States of India with 16 endemics [8] (Table 1). The North East India is believed to be the centre of origin of the genus *Hedychium* [9].

Sl. No	Region	Genera	Species
1.	India	22	200
2.	South India	10	65
3.	Andaman & Nicobar Is.	10	23
4.	Bihar & Orissa	8	37
5.	North East India	20	122
6.	Mizoram	14	52

Table 1: Distribution status of Zingiberaceae in India.

Study area

Mizoram lies at the extreme corner of the extended Himalayan range in the North East India. Basically, it is a mountainous terrain with a total geographical area of 21,081 sq.km which is about the size of El Salvador. The total population is about 1 million with a density of 52 /km². It became a full-fledged State in 1987 in the Indian union and stood second highest in literacy next to Kerala State (Census 2011) and highest forest cover (88.93%) in the country (SFR 2015). There are ten protected areas and the present study mainly concentrated in the protected areas, such as, Phawngpui National Park (50 km²), Murlen National Park (100 km²), Ngenpui Wildlife Sanctuary(110 km²), Dampa Tiger Reserve (500 km²), Thorang Wildlife Sanctuary (50 km²), Tawi Wildlife Sanctuary (50 km²), Lengtung Wildlife Sanctuary (60 km²), Pualreng Wildlife Sanctuary (50 km²), Khawnglung Wildlife Sanctuary (37.5 km²) and Palak Wildlife Sanctuary (5 km²/proposed to extend to 15 km²) and selected reserve forests (Figure 1). The species of Zingiberaceae, being shade loving plants, are mainly distributed under forests and shady places.

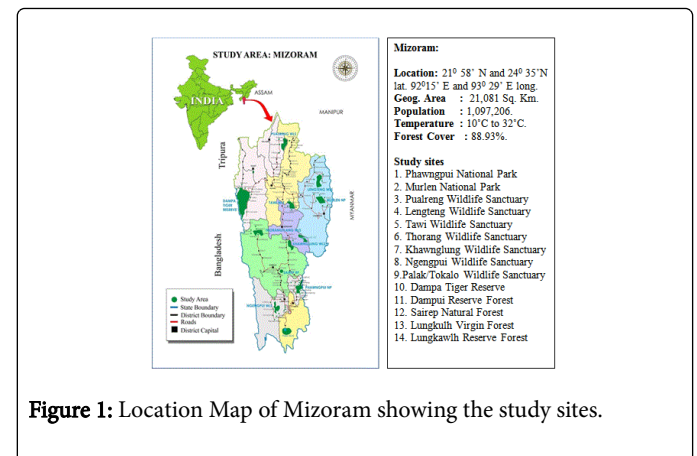


Figure 1: Location Map of Mizoram showing the study sites.

The present study was carried out in Mizoram during 2007-2010. Mizoram is one of the States of North East India and has a very high concentration of Zingiberaceae. During the study, 52 species under 14 genera were found to be present and recorded in Mizoram.

Flowers white, yellowish or reddish, fragrant; calyx tubular, usually split on 1 side, apex truncate or 3-toothed; corolla tube slender or twisted, glabrous or pubescent, 3-lobed, lobes linear, apex hooded; lateral staminodes petaloid, linear-oblong, oblanceolate, or elliptic, larger than corolla lobes; labellum ovate-elliptic, obovate or sub-orbicular, base attenuate into claw, apex acute or emarginated usually to deeply divided; filament shorter or longer than labellum; anther dorsifixed, base divaricate 0.5-2.0 cm long; ovary glabrous or pubescent, 3-loculed, axile placentation, epigynous glands 2; connective appendage absent. Stigma densely ciliate, green. Capsule glabrous or pubescent, globose, 3-valved. Seeds numerous; aril lacerate.

Results and Discussion

Twelve species of *Hedychium* found in Mizoram are presented in detail in parentheses and discussed the status of the genus *Hedychium* with key to the species and their ecological status in a brief manner.

Hedychium J. Koen.

Terrestrial, epiphytic, perennial herb with tuberous rhizomes. Pseudostems erect, leafy 0.4-2.6 m high. Ligule conspicuous, 0.2-5.9 cm long, pubescent or glabrous, apex truncate-emarginated, acute, bilobed leaf blade usually oblong or lanceolate, 0.2-6.0 cm long, pubescent or glabrous. Leaves oblong lanceolate or elliptic, base cuneate, apex acute, margin entire to lightly undulate, upper surface glabrous, lower surface glabrous or pubescent. Inflorescence a terminal spike, densely numerous flowered; bracts imbricate or lax, 1 or more flowered; bracteoles tubular.

Key species of Mizoram *Hedychium*

H. wardii

H. spicatum

H. villosum

H. rubrum

H. coccineum

H. dekianum

H. stenopetalum

H. coronarium

H. thyrsoforme

H. ellipticum

H. flavescens

H. yunnanense

Pseudostems 1.5-2.0 m, leaf sheaths green, bladeless sheaths 2-3. Ligule 2.7-3.0 by 1.4-1.6 cm, oblong, pubescent, green. Leaves sessile; leaf blade leathery, sparsely pubescent, rarely glabrous narrow linear, 35-50 × 3-5 cm, upper surface glabrous, lower surface pubescent, base sub-rounded or attenuate, apex caudate-acuminate, margin entire. Inflorescence a terminal spike, cylindrical, erect, 15.0-35.0 cm long,

hairy; peduncle 5.5-15.5 cm long, hairy; bracts oblong, 3-3.5 cm long, leathery, sparsely pubescent, rarely glabrous, 4-6 flowered. bracteole tubular, 1.5-2.4 × 0.4-0.6 cm, hairy, greenish. Flowers crimson red; calyx tubular, 2.5-3.5 × 0.3-0.5 cm, sparsely pubescent especially at 3-toothed apex; corolla tube slender, 2.5-2.7 × 0.2-0.3 cm long, linear, reddish, equal to or slightly longer than calyx.; lobe 3-lobed, linear, 2.7-3.9 × 0.3-0.5 cm, apex hooded, red; lateral staminodes oblanceolate, 2.3-3.0 × 0.5-0.8 cm; labellum suborbicular or orbicular, 1.8-2.5 × 1.5-2.0 cm, apex deeply divided; filament red, ca. 5 cm; anther 0.7-0.8 mm long dorsifixed, red; ovary sericeous, 3.0-5.2 × 2.5-4.0 mm, 3-loculed, placentation axile, pubescent; epigynous glands 2, slender, yellowish; stigma densely ciliate, green. Fruits ovoid-oblong, 2.6-3.8 × 2.3-2.5 cm, pubescent, green. Seeds numerous, ovoid-oblong, 4.2-5.5 × 2.0-3.5 mm, aril reddish orange.

Vernacular name: Aidu-par-sen

Common name: Disney ginger, Salmon ginger, scarlet ginger-lily.

Species examined: Mizoram, Haulawng, Lunglei Dist., L. Vanchhawng & H. Lalramnghinglova 42804 (MZU).

Distribution: *Hedychium coccineum* is found in North eastern states of India, and common in Mizoram.

Ecology: Tropical and sub-tropical semi-evergreen forests, full sun to part shade, moist, rich well-drained soil at the altitude of 300-1500 m.

Phenology: Flowering: July to August; Fruiting: September to October.

Remarks: The species is usually cultivated in gardens as an ornamental.

Rhizomes thick, 2-3 cm, fleshy, yellow inside, roots many. Pseudostems 1-3 m, leaf sheaths reddish, bladeless sheaths 4-5. Ligule 2.0-3.8 × 2.5-3.0 cm, membranous, apex truncate emarginate, oblong, pubescent, greenish. Leaves sessile; leaf blade oblong-lanceolate or lanceolate, 20-40 × 4.5-8 cm, abaxially glabrous, finely pubescent or thinly hairy, base acute, apex long, acuminate. Inflorescence terminal spike, erect, ellipsoid, hairy, 10-20 × 4-8 cm; peduncle 1.7-4.1 cm long, hairy; bracts imbricate, ovate, 4.5-5 × 2.5-4 cm, 4 to 5 - flowered, apex rounded, glabrous except apex and margin hairy, green; bracteole folded, lanceolate, apex acute, greenish-white, 2.9-3.7 × 0.5-1.2 cm. Flowers white, fragrant; calyx tubular, 3.5-4.3 × 0.3-0.4 cm, pubescent, split on 1 side; corolla tube ca. 6.0-8.0 × 2.5-3.0 cm, slender, 3-lobed; lobes linear, apex hooded, thorn-like, white, 2.5-2.9 × 0.4-0.5 cm; lateral staminodes oblong-lanceolate, 4.1-5.0 × 1.8-2.0 cm; labellum white, pale yellow at base, obcordate, 4.0-6.0 × 4.0-6.0 cm; filament white, ca. 3 cm long; anther creamy white to pale yellow, dorsifixed; ca. 1.5 cm long; ovary glabrous or sparsely hairy, 3-4.5 × 1.8-3.0 mm, 3-loculed, placentation axile; epigynous glands 2, slender, ca. 2 mm long, yellowish; stigma densely ciliate, green. Fruits ellipsoid-oblong, 2.0-2.5 × 1.8-2.2 cm, green. Seeds numerous, elliptic-globose, 5-7 × 3.5-5.0 mm, reddish orange.

Vernacular name: Ai-lalnu

Common name: Butterfly Lily, Garland flower.

Species examined: Mizoram, Pukpui-Lunglei, Lunglei Dist., L. Vanchhawng & H. Lalramnghinglova 42803 (MZU).

Distribution: In India, it is common in Assam, Meghalaya, Arunachal Pradesh, South India. In Mizoram, this taxon is cultivated in private homestead gardens in small populations only.

Ecology: Grown in open and/or partial shaded areas on sandy loose soil at the altitude of 600-1200 m.

Phenology: Flowering & Fruiting: June-December.

Remarks: The fragrant flower is widely used for perfumes.

Synonym: *Hedychium forrestii* Diels.

Rhizomes 3.3-3.6 cm wide, creamy white inside, pale pink outside, faintly aromatic, covered by brown scales. Pseudostem 1.2-2.0 m high, erect, robust. Ligule villous, 2.5-5.2 × ca. 2 cm, oblong, single lobed, slightly notched at tip, pale green. Leaves sessile, green, margins pink, membranous, translucent, pubescent; leafblade lanceolate to oblong-lanceolate, subcaudate, 30-50 × 5.5-13.0 cm, appressed silky beneath. Inflorescence 10-27 × 3.0-6.0 cm; cylindrical, erect, moderately lax; peduncle green, pubescent; bract oblong, closely convolute, 4.0-6.0 × 1.5-2.0 cm, pubescent, scarious-margined, acute-obtuse, each bract enclosing 3-9 successively opening flowers; bracteoles ovate-oblong, 3.0-3.5 × 1.0-1.7 cm, pubescent. Flowers white with pale yellow blotch on lip, fragrant; calyx membranous, tubular, slightly shorter or longer than the bract, pubescent, 3-toothed, deeply split in one side; corolla tube 4.0-6.5 × 2.8-3.5 cm, white, glabrous externally, hairy internally, corolla lobes linear, oblanceolate, white, pale green tinged towards the tip, membranous, 3.5-4.7 × 0.5-0.6 cm, exceeding the bracts; lateral staminode spatulate, 2.5-3.6 × 1-1.5 cm, elliptic-oblanceolate, white, spreading on flower tip, obtuse, margin undulate; labellum 3.5-3.8 × 3.1-3.5 cm, ovate-orbicular, white, pale yellow tinge at centre and claw; filament 4.0-4.5 × ca. 0.2 cm, white, erect; anther linear, 1.1-1.3 × ca. 0.25 cm, oblong, creamy white, split opens from top to bottom, glabrous, slightly notched, tip truncate; ovary 4.5-5 × 3-3.5 mm, barrel-shaped, pale green, densely pubescent, trilobular, placentation axile; epigynous glands 2, 3.0-3.5 mm long, oblong, bright yellow; stigma green, cup-shaped, densely pubescent, hairs hook-like. Fruits oblong cylindrical, sparsely hairy, 4-6 cm long, yellow green outside, orange inside. Seeds sub-globose, bright red.

Vernacular name: Not available.

Common name: Not available.

Species examined: Mizoram, Dampa Tiger Reserve, Mamit Dist., L. Vanchhawng & H. Lalramnghinglova 428900 (MZU).

Distribution: The species is endemic in Jowai, Meghalaya and Mizoram.

Ecology: Grown in loamy soil with rich humus under secondary forests, on open or partially shaded places. Altitude: 800-1500 m.

Phenology: Flowering & Fruiting: July- September.

Remarks: Crushed rhizome is applied on wounds and cuts (Kala, 2005).

Rhizome thick, yellowish green outside, roots large, root hairs abundant. Pseudostem ca. 1.4 m high. Ligule oblong, 1.1-1.2 × 1.2-1.4 cm, membranous, glabrous or sparsely hairy, bright red. Leaves sessile with upto 3 cm long petiole; leaf blade 25-30 × 8-14 cm, base cuneate, apex acute, margin entire, oblong glabrous. Inflorescence terminal spike, erect, 5-8 cm long, cone like dense flowered; peduncle 3.5-6.0 cm long, glabrous; bracts imbricate, folded, oblong, 1.7-3.0 × 0.8-1.0 cm navicular, glabrous, green, 1-flowered; bracteole tubular, 1.0-1.4 × 0.3-0.4 cm, apex acute, membranous, glabrous. Flowers white turning yellow, fragrant; calyx tubular, 2.5-3.0 × 0.3-0.4 cm, apex acute to 3-dented, glabrous; corolla tube slender, 5.0-5.5 × 0.3-0.4 cm, oblanceolate or spatulate, yellowish, 3-lobed; lobes linear 5.1-5.7 ×

0.3-0.4 cm, apex hooded, yellowish; lateral staminodes 2.5-3.0 × 0.3-0.5 cm, labellum lanceolate with two segments, upper part elliptic, 3.4-3.9 × 0.8-1.2 cm, lower part attenuate into a 1.4-1.7 × 0.2-0.3 cm claw, apex acute-emarginate; filaments yellowish red, 5.5-5.6 cm long; anther linear, 1.3-1.5 × 0.3-0.4 cm, orange yellow; ovary glabrous or sparsely hairy, 3.0-4.0 × 4.0-5.0 mm, 3-loculed, placentation axile; epigynous glands 2, slender, 2.0 × 1.0-2.0 mm, yellowish; stigma densely ciliate, green. Fruits globose, 0.9-1.3 × 0.8-1.2 cm, glabrous, green. Seeds numerous, ellipsoid globose, 4.0-5.0 × 3.0 mm, aril reddish-orange.

Vernacular name: Not available.

Common name: Shaving Brush Ginger, Rock Butterfly Lily.

Species examined: Mizoram, Murlen N.P., Champhai Dist., L. Vanchhawng & H. Lalramnghinglova 42879 (MZU).

Distribution: This species is a native of Eastern Himalayas and North East India. It is found in Thailand, Nepal, Bhutan, Myanmar and Laos.

Ecology: The plant grows well in semi shaded; and prefers high level of water where it can be found growing on shaded mud slopes. Altitude: 300-1500 m.

Phenology: Flowering & Fruiting: June-September.

Remark: First reported from Mizoram.

Rhizomes ca. 3 cm in diameter, branched, fragrant, thick fleshy, roots many, light greyish-yellow inside. Pseudostems 1-3 m in height. Ligule 3-5 cm long, membranous. Leaves sessile; leaf sheath slightly pubescent; leaf blades elliptic-lanceolate or lanceolate, 30-45 × 5-7 cm, tapers at base, glabrous above, pubescent beneath, margin membranous, apex caudate-acuminate. Inflorescences oblong spikes, 15-20 cm, 3-6 cm wide; bracts imbricate, oblong to ovate, concave, 4 or 5-flowered; bracteoles tubular, membranous. Flowers creamy-white to pale yellow, fragrant with yellow stamens; calyx 3.5-4 cm long, split on one side, apical margin entire, pubescent approximately half the length of the corolla tube and equaling to bracts; corolla tube 7-8.5 cm, yellowish, long and slender; lobe linear, 3-3.5 cm long; lateral staminodes white, spatulate to lanceolate, wider than corolla lobes; labellum erect, creamy yellow with an orange patch at base, obcordate, apex 2-lobed. filament linear, ca. 3 cm long, pinkish yellow; another large, yellowish red; ovary hairy, pubescent; stigma cup shaped, margin ciliated, extending beyond the anther. Fruits globose, three valves. Seeds numerous, red after maturation, arillate.

Vernacular name: Aidu-par-eng.

Common name: Yellow Ginger, Cream Garland-lily, Cream Ginger.

Species examined: Mizoram, Murlen N.P., Champhai Dist., L. Vanchhawng & H. Lalramnghinglova 42882 (MZU).

Distribution: The plant is native to the eastern Himalayas.

Ecology: The plant grows under full or partial shade of rainforests, moist forests and in a rich moist soil along water courses. Altitude: 600-1200 m.

Phenology: Flowering: July & August, Fruiting: September.

Remark: First reported from Mizoram.

Rhizome creeping, scaly, white inside, non-aromatic. Pseudostem 0.5-1.2 m tall. Ligule 1-3.2 cm long, entire, pubescent, pinkish green. Leaves sessile; leaf blade lanceolate, 17-32 × 3-7 cm, subcaudate, upper

surface glabrous, lower surface hairy along midrib. Inflorescence 6-14 cm long; rachis villous; bracts 10-18, oblong, closely convolute, 3.5-4.7 × 1.5-2 cm, pubescent, purplish green, acute, 2-flowered; bracteole membranous, reddish brown; Flowers calyx tubular, 2.4-2.8 cm long, 3-toothed, split on one side, pubescent, pale reddish; corolla red with whitish base and fading red at the tip; lobe ca. 3.5 cm, red; lateral staminodes obliquely spatulate, red, slightly shorter than the lip, ca. 8 mm broad, apex rounded; labellum suborbicular, red, shortly clawed, deeply bilobed; filament ca. 4 cm long, red; anther linear, ca. 1 cm long, saffron red; ovary subglobose, ca. 2 mm, villous; stigma turbinate, hairy, green. Fruit subglobose or broadly ovoid sub-trigonal pink red outside, orange inside. Seeds with aril subglobose, bright red, ca. 5 mm.

Vernacular name: Murlen-ai-par.

Common name: Yellow Ginger, Cream Garland.

Species examined: Mizoram, Murlen N.P., Champhai Dist., L. Vanchhawng & H. Lalramnghinglova 42873 (MZU).

Distribution: The plant is endemic to Meghalaya and Mizoram.

Ecology: Grown along the margin of tropical evergreen forests on a moist loamy soil. The plant is also found to grow with grasses species in an open space, fully or partially shaded.

Phenology: Flowering & Fruiting: July-October.

Remark: First reported from Mizoram.

Rhizome strong aromatic odour and bitter taste. Pseudostems 50-120 cm high, bladeless sheaths 2-4. Ligule oblong, 1.0-2.5 × 2.2-3.0 cm, membranous, pubescent, apex emarginate or acute. Leaves elliptic-oblong, 30-40 × 10-12 cm apex acute-acuminate, upper surface glabrous, lower surface glabrous or sparsely hairy; Inflorescence a terminal spike, erect, 20-35 cm long; peduncle 6.0-12.0 cm long, glabrous; bracts lax, folded, greenish, lanceolate-oblong, 2.0-4.4 × 1.2-2.4 cm apex acute, glabrous or sparsely hairy, 1-flowered; bracteole tubular, apex acute, membranous, glabrous or sparsely hairy. Flowers white tinged yellow or reddish at base, fragrant; calyx tubular, apex acute to 3-lobed, glabrous or sparsely hairy; corolla tube 5.2-6.5 cm, slender, 3-lobed, apex hooded, yellowish; lobes linear, ca. 2.5 cm, base sometimes purplish red; lateral staminodes oblanceolate-oblong; labellum obovate, apex bilobed, each lobe elliptic, white with pale salmon red patch at base; filament 2.0-2.5 cm long, salmon red; anther dorsifixed, 1.5-2.0 × 0.3-0.4 cm base divaricate, salmon red; ovary, 3-loculed, placentation axile, hairy; epigynous glands 2, slender, 1.8-2.0 × 0.1-0.2 cm, yellowish; stigma densely ciliate, green. Fruits ellipsoid-oblong, globose, 2.0-3.0 × 1.2-2.0 cm, hairy greenish yellow, orange inside. Seeds numerous, ellipsoid-orbicular, 4.0-5.0 × 0.2-0.3 cm, reddish orange.

Local name: Ai-par-zum.

Vernacular name: Spiked Ginger Lily (English), Kapur-kachari (Hindi).

Species examined: Mizoram, Murlen N.P., Champhai Dist., L. Vanchhawng & H. Lalramnghinglova 42875 (MZU).

Ecology: The plant grows well in moist, sunny position and wide range of climatic conditions forests. The plant prefers sandy loamy and clayey soil. It cannot grow in the shade and susceptible to frost. Altitude: 800-1200 m.

Distribution: It is distributed in sub-tropical region of Himalaya and other states of NE India within an altitudinal range of 1000-3000 m.

Phenology: Flowering: July & August, Fruiting: September to November.

Remarks: The rhizome has been used in various traditions for treating numerous health conditions.

Pseudostems 2-3 m high, leaf sheaths greenish, bladeless 2-4 sheaths. Ligule oblong, 4.3-5.9 × 5.2-6.0 cm, apex rounded-emarginate, membranous, hairy, greenish or reddish. Leaves petiolate, blade lanceolate-oblong, 50-65 × 9-15 cm, upper surface glabrous, lower surface hairy. Inflorescence terminal, spike, erect, 40-60 cm long, hairy, lax-flowered; peduncle 12.5-23.5 cm long, hairy; bracts lax, folded, green, lanceolate to obovate, 3.5-4.5 × 1.3-1.5 cm, convolute, 2-4-flowered; bracteoles triangular, apex acute, 2.7-2.8 by 1.4-1.6 cm, membranous, pubescent. Flowers white with pale yellow blotch in mouth, fragrant; calyx tubular, 5.5-6.2 × 2.8-4.0 cm, pubescent, apex 3-dent; corolla tube slender, 5.7-6.2 × 0.3-0.4 cm, longer than the bract, 3-lobed, thorn-like, white; lobes linear, apex hooded, thorn-like, white, 5.4-5.6 × 0.4-0.5 cm; lateral staminodes narrowly oblanceolate, 3.2-4.5 × 0.0-0.9 cm, notched; labellum sub-orbicular to orbicular, 3.1-4.2 × 2.5-3.4 cm, white with pale greenish patch at base; filament 5.2-6.5 cm long, yellowish; anther dorsifixed, 1.2-1.5 × 0.2-0.3 cm, yellowish; ovary pubescent, 0.4-0.5 × 0.6-0.8 mm, 3-loculed, placentation axile. epigynous glands 2, slender, 5-6 × 0.8-1 mm, yellowish; stigma densely ciliate, green. Fruits ovoid to oblong, 3.0-4.2 × 1.4-1.8 cm, green, hairy. Seeds numerous, ellipsoid to sub-globose, 5.2-6.0 × 4.0-5.0 mm, reddish orange.

Vernacular name: Aidu-par-var.

Common name: Slender petal Ginger, White star ginger.

Species examined: Mizoram, Murlen N.P., Champhai Dist., L. Vanchhawng & H. Lalramnghinglova 42874 (MZU).

Ecology: The plant grows well in semi-shade and direct sun in a rich moist well-drained soil.

Distribution: Native to India and found in the state of found in Meghalaya, Arunachal Pradesh, Assam and Mizoram. Altitude: 500-900 m.

Phenology: Flowering: June & July, Fruiting: August & September.

Remark: First reported from Mizoram.

Rhizome tuberous, fleshy, with long, cord-like fibres. Pseudostem 0.7-1.5 m high. Leaves sub-sessile; leaf-blade 30-50 × 8-12 cm, oblong or oblong-lanceolate, villous beneath, strongly nerved, of a shining green colour on the upper surface, paler below; Inflorescence oblong, 8-20 cm long, very dense flowers or compact; bract 2-3 cm long, lower empty, ovate, the upper 2-flowered, convolute, cylindrical, green; Flowers white, fragrant; calyx 2.5-3 cm long, slender, superior, 3-toothed; corolla tube ca. 3 cm longer than bracts; lobes 3-4 cm long, white; lateral staminodes 2-2.5 × 0.2 cm, linear; white; labellum 2-2.5 × 1-5 cm, obovate, clawed with yellow blotchy at the base, deeply bifid into two acute lobes; filament 4.5-6.5 cm long, white; anther 0.8-1 cm, linear, whitish in colour, broad-ovate, large, reflected; ovary pubescent, ca. 3 × 5-6 mm, placentation axile; stigma a ciliated cup, greenish yellow or pale yellow, ca. 2-3 mm. Fruits green, hairy, ca. 3 cm in diameter. Seeds ellipsoid to sub-globose, 4-5 × 3-4 mm.

Vernacular name: Ai-parbawr.

Common name: Pincushion Ginger, Garland Lily, Frilly White Ginger

Species examined: Mizoram, Tanhril, Aizawl Dist., L. Vanchhawng & H. Lalramnghinglova 42839 (MZU).

Ecology: The plant grows in a humus rich well-drained soil in a sunny sheltered place.

Distribution: Native to humid forests the Himalayas region and NE India between the altitudinal range of 600 and 1200 m.

Phenology: Flowering: July & August, Fruiting: August & September.

Remark: First reported from Mizoram.

Pseudostem 60-90 cm high, erect, slender, leaf sheaths red, bladeless sheaths 3-5. Ligule single-lobed, oblong, 3.5-8.7 × 1.2-2.4 cm, apex acute, membranous, villous to pubescent, reddish, tip acute. Leaves 8-12 in number, sessile; leaf blade 14-20 × 3.7-4.5 cm, elliptic lanceolate, dark green and glabrous above, pale green and pubescent along midrib, base cuneate-oblique, apex acute, margin entire to slightly undulate. Inflorescence terminal, 16.5-33 cm long, erect, cylindrical; peduncle 1.8-2.6 cm long, hairy; bract lax, folded, convolute, elliptic, reddish brown, pubescent, bracts, elliptic, 5.4-6.8 × 1.2-2.1 cm, apex acute, 1-3 flowered; bracteole ovate-broadly ovate, 2.2-5.2 by 1.4-1.9 cm, apex acute, greenish or reddish membranous. Flower 4.7-5.2 cm long, white to pale yellow, highly fragrant; calyx tubular, ca. 4 × ca. 0.3 cm, convolute towards the tip, membranous, hairs brown; obscurely 3-lobed at tip; corolla tube slender, 3.5-5.1 × 0.2-0.4 cm, straight, exceeding the calyx and bract, pale yellow, densely pubescent externally, hairy internally 3-lobed; lobes oblong, pale yellow, lower half pubescent externally, glabrous on upper half, margins non-ciliate, 1.6-1.7 × 0.15-0.2 cm long; lateral staminodes linear, lanceolate-oblong, ca. 3.5 × 0.5-0.8 cm, straight, pale yellow, tip acute; labellum elliptic, narrow towards base, 2.5-2.8 × ca. 2.5 cm, pale yellow, lobes tip acute; filament 2.9-4.6 cm long, scarlet, straight; anther sagittate, reddish, brown, glabrous, glabrous; ovary oblong, pale green, placentation axile, densely pubescent externally; epigynous glands 2, slender, ca. 3 × 0.5 mm yellowish; stigma cup-shaped, margin ciliate, green, exerted from anther. Fruits ovoid-oblong, 1.3-1.6 × 1.3-1.4 cm, pubescent, greenish. Seeds numerous, ellipsoid-orbicular, 0.4-1.2 × 0.4-0.5 mm, aril reddish orange.

Vernacular name: Ai-hmul

Common name: Haired Ginger Lily, Hardy Ginger.

Species examined: Mizoram, Sialsuk, Aizawl Dist., L. Vanchhawng & H. Lalramnghinglova 42836 (MZU).

Phenology: Flowering: February to April, Fruiting: Not seen.

Ecology: The plant is growing on tall trees or moist slopes and in rocky crevices.

Distribution: The taxon originated in China (Kress et. al., 2002). The plant is distributed in Bangladesh, China, India and Myanmar from 600 to 1500 m in India, it is found in the North eastern states of Arunachal Pradesh, Assam, Meghalaya and Mizoram.

Rhizomes stout, pink, fleshy, aromatic. Pseudostem 0.7-1.5 m high. Ligule 2-3 cm long, pubescent, reddish green. Leaves sessile; leaf blade oblong-lanceolate, caudate-acuminate, 30-45 × 6-9 cm, appressed hairy beneath; leaf sheath pubescent. Inflorescence ca. 15 cm tall compact, cone-like; peduncle reddish yellow to bright yellow, 2-3 cm

long; bract reddish brown to greenish red at the tip, oblanceolate, ca. 1 × 2-3 cm; bracteole greenish yellow; membranous. Flowers bright yellow, fragrant; calyx tubular, ca. 3 cm long, 3-toothed, split on one side, bright yellow; corolla tube 4-5.5 cm; reddish yellow at the base and pale yellow at the tip; lobes linear 5.5-6.0 × 2-3 cm, yellowish; lateral staminode spatulate, 1.8-2.5 × 1.0-1.6 cm, reddish yellow; labellum sub-orbicular, 2.2-3.0 × 2.5-3.2 cm, bilobed; filament 3-4 cm long; bright yellow with reddish patches at the base; anther linear, ca. 1 cm long, reddish yellow; ovary globose or sub-globose, ca. 2 mm, stigma pale yellow to greenish yellow, ca. 2-3 mm long. Fruit sub-globose or broadly ovoid, ca 3 cm in diameter. Seeds with aril sub-globose, ca. 5 mm.

Vernacular name: Ai-sawhthing

Common name: Ginger Lily (English).

Species examined: Mizoram, Murlen N.P, Champhai Dist., L. Vanchhawng & H. Lalramnghinglova 42867 (MZU).

Ecology: Open or partially shady places of grassland and secondary forests or along forest margin amidst grasses. The plants thrive well in moist loamy soil with rich humus.

Distribution: The taxon is native to North Eastern India viz. Arunachal Pradesh, Meghalaya and Mizoram. Altitude: 800-1500 m.

Phenology: Flowering & Fruiting: July-September.

Rhizome stout, yellow inside, yellowish brown outside. Pseudostems stout, 2-3 m high. Ligule oblong, entire, 1.5-2.5 cm, membranous; Leave glabrous, base attenuate into short petiole, apex caudate; leaf blade ovate-oblong to oblong lanceolate, 20-40 × ca. 10 cm. Inflorescence up to 20 cm, slender bearing a number of flowers; bracts lanceolate, 1.5-2.5 cm, glabrous, 1-flowered, margin involute; bracteole tubular, apex acute, ca. 3 × 1.5-2.0 cm, membranous, glabrous or sparsely hairy, pale green; Flowers calyx 1.7-2.8 cm, apex obtusely 3-toothed, ciliate; corolla tube 3.5-5 cm, slender, orange red; lobes linear, ca. 1 cm; pinkish red at the base, whitish at the tip; lateral staminodes oblong-linear, shorter and wider than corolla lobes, base narrowed; labellum obovate, ca. 2 cm, bilobed, pinkish red at the base, pinkish white at the tip; filament yellowish red, ca. 4 cm long; anther reddish or yellowish red, ca. 1 cm. ovary pilose; stigma ciliate. Fruit yellowish when it is ripening, ca. 2 cm in diameter; Seeds many, aril red.

Vernacular name: China-ai.

Common name: Yunnan Ginger Lily.

Species examined: Mizoram, Murlen N.P, Champhai Dist., L. Vanchhawng & H. Lalramnghinglova 42876 (MZU).

Ecology: Grown in loamy soil with rich humus under evergreen or semi-evergreen forests.

Distribution: Native to, North Eastern states of India.

Phenology: Flowering: July & August, Fruiting: Not seen.

Remark: First reported from India.

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